IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Kevin M. Conley et al.		
Assignee:	SanDisk Corporation		
Title:	Management Of Non-Volatile Memory Systems Having Large Erase Blocks		
Application No.:	10/749,831	Filing Date:	December 30, 2003
Examiner:	Eland, Shawn	Group Art Unit:	2188
Docket No.:	SNDK.247US0	Conf. No.:	9380

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Commissioner for Patents
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REPLY BRIEF UNDER 37 C.F.R. 41.41

Sir:

This is in reply to the Examiner's Answer mailed January 14, 2010. Since section (9) "Grounds of Rejections" of the Answer (pages 3-13) appears to merely repeat the final Office Action mailed December 12, 2008, which has already been discussed in the Appeal Brief filed June 22, 2009, this will reply to the "Response to Argument" of section (10) on pages 13-15 of the Examiner's Answer.

Appellant argues:

The Examiner's interpretation of "proportion" is contrary to the way the term is used in the present application.

Examiner response:

The term proportion, by itself can mean 100%, as that's the full proportion of something. 200% is a double portion. A "preset proportion" by itself is also just as ambiguous as it only "presets" the proportion. It does not limit the size of the proportion. Without any further qualifiers in the claim language the Examiner can use any ratio as he sees fit. The Examiner was merely arguing against Appellant's statement that proportion can never mean 100%. It is the addition of "the pre-set proportion being less than the given number of units" into the claim language that further limits the claims. Of this, the Appellant and Examiner agree. However, this doesn't change the fact that Conley still writes data to a block, said data being smaller than the block (for example, figure 14, steps 52, 53, 61, and 65) and thus partially fills a block.

Appellant's Reply:

The issue is not whether Conley writes a chunk of data smaller than the block. Conley writes to another block based on whether the current block has enough space left to accommodate the current write chunk. In other words, Conley writes to another block (*any* available block) if write chunk size > space available in current block. No "pre-set" proportion of the block size enters into this. In contrast, Appellant's claimed criterion is to write to a dedicated block ("E1" block) when the write chunk size is less than a "pre-set" proportion of the block size, the pre-set proportion being less than the block size.

The invention relates to storing update data pages in blocks. This is described in the Abstract, in the Summary of the Invention and for example in [0056]-[0066]. Each block is capable of storing a given number of pages of data. The pages in a block are all erasable together. Normally, data pages are assigned logical addresses by a host. When a host command writes a number of pages into a memory block, they are written in sequential order of logical addresses. This creates an "E2" block. See FIG. 6.

Later, when another host command writes some more pages which have a range of logical addresses already in an existing E2 block, the write amounts to updating an existing E2 block. However, it can not simply overwrite the E2 block since the flash memory block must first be erased before writing to it again. Instead, the update data pages must be written to a new

erased block. Here, the conventional updating method is illustrated in FIG. 6 where the update pages replace the obsolete pages of the existing E2 block and the entire updated block of pages is written to a new E2 block. This method of updating E2 block obviously involves a lot of copying from the existing to the new E2 block and presents a large overhead especially when only a small portion of the pages in the block is being updated.

The invention prescribes an alternative method of updating when only a small portion of the pages in the block is being updated. Instead of consolidating the data from the existing E2 block into the new block, only the update data is stored in the new block. Thus, this new block labeled as "E1" block is like a buffer for temporarily storing the update pages. Eventually, these updates pages are consolidated with the non-obsolete pages of the E2 blocks to form updated E2 blocks. In this way, if there are a number of host writes with a small number of pages each, they can all be collected in an E1 block without having to consolidate to a new E2 block between each of the writes. See [0064]-[0065], FIGs. 6 - 9.

Appellant argues:

Claims 2 and 28 call for applying a plurality of programming commands for receiving a number of units of data with successive commands, instead of using Conley's single command.

Examiner response:

Conley checks the ability of a partial block fill with every incoming command. If multiple commands with partial block data come from the host, then Conley does not break down. Conley is very flexible in this regard.

Appellant's Reply:

While Conley may check with each write command whether the chunk to be written fits within the current block, it does not, as in Appellant's claimed invention, check for every write among multiple write commands whether the write chunk size is less than a "pre-set" proportion of the block size, the pre-set proportion being less than the block size.

Appellant argues:

It is not clear that Kulkarni discloses filling up its non-volatile memory blocks to only 50% of their capacity.

Examiner response:

There appears to be a contradiction in the Appellant's argument. The Appellant states, starting on line 2 of page 10 of the Appeal brief (filed 06/22/09), that "Kulkarni only states that the 50% point is when data are then written from the RAM into the non-volatile memory." As stated in the last Office action, the RAM block corresponds to the non-volatile blocks in size. When you write (i.e. fill) a block that is 50% in RAM, you fill your non-volatile block at 50%. Finally, it should also be noted that Kulkarni is used in conjunction with Conley as a 35 U.S.C. 103 rejection and it is the part of first writing to RAM and then moving the partially filled data to the non-volatile memory.

Appellant's Reply:

The Appellant original argument must be understood in the context of the definition of a memory block. The whole point of Appellant's invention is to deal with memory blocks in which a large number of pages constituting each block are erased simultaneous before any existing pages can be overwritten. In this context, the memory block is a minimum unit of erase and the page is a unit of write and read. The invention avoids inefficiency in dealing with a large block size by writing small chunks (number of pages) of update data into an E1 block instead of rewriting a whole E2 block every time. Appellant's earlier comment is that Kulkarni's memory block, unlike Appellant's" is not defined as a "minimum erase block" but defined as "the memory blocks 140 represent a minimum size of data that can be written to the flash memory 132 during a write procedure." (See paragraph [0034].) Thus, the "memory blocks 140" to which Kulkarni refers are really the "pages" of Appellant's. Kulkarni never mentions or seems concerned about the "minimum erase block" that Appellant's invention deals with. Thus, when talking about blocks, Kulkarni and Appellant refer respectfully to different structures and Kulkarni cannot be properly combined with Conley.

For these reasons in reply, reversal of the Examiner's final rejection of claims 2-4 and 26-41 is solicited.

FILED VIA EFS

Respectfully submitted,

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Date

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